SPECIFICATION
FOR
APPROVAL

( ) Preliminary Specification
(●) Final Specification

Title	42.0” WUXGA TFT LCD

BUYER	General
MODEL	

SUPPLIER	LG.Display Co., Ltd.
*MODEL	LC420EUS
SUFFIX	SCA1 (RoHS Verified)

*When you obtain standard approval,
please use the above model name without suffix

APPROVED BY	SIGNATURE DATE
/	
/	
/	

Please return 1 copy for your confirmation with your signature and comments.

APPROVED BY	SIGNATURE DATE
J. T Eo / Team Leader	
REVIEWED BY	
S. W Yu / Project Leader	
PREPARED BY	
J. T Jung / Engineer	

TV Products Development Dept.
LG. Display LCD Co., Ltd

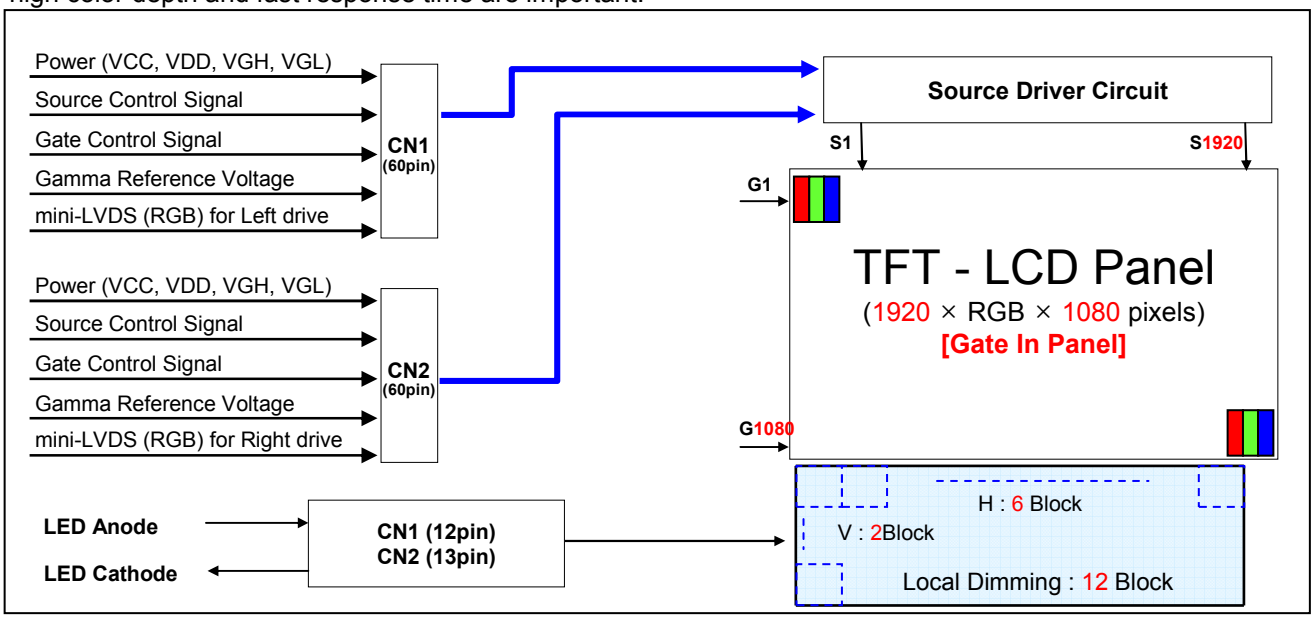
CONTENTS

RECORD OF REVISIONS

Revision No.	Revision Date	Page	Description
0.0	Feb, 8, 2010	-	Preliminary Specification (First Draft)
0.1	Mar.1.2010	7,8	Updated the electrical Spec.
		18	Updated the Optical Spec.
		23,24	Updated the mechanical drawing.
0.2	Mar.29.2010	18	Updated the Optical Spec.
		33	Updated the Appendix III
1.0	Mar.29.2010	-	Final Specification

1. General Description

The LC420EUS is a Color Active Matrix Liquid Crystal Display with an integral Light Emitting Diode (LED) backlight system. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive type display operating in the normally black mode. It has a 42.02 inch diagonally measured active display area with WUXGA resolution (1080 vertical by 1920 horizontal pixel array). Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the luminance of the sub-pixel color is determined with a 8-bit gray scale signal for each dot. Therefore, it can present a palette of more than 16.7M(true) colors.
It is intended to support LCD TV, PCTV where high brightness, super wide viewing angle, high color gamut, high color depth and fast response time are important.



General Features

Active Screen Size	42.02 inches(1067.31mm) diagonal
Outline Dimension	973.2(H) x 566.2 (V) x 10.8 mm(B)/25.3(D) (Typ.)
Pixel Pitch	0.4845 mm x 0.4845 mm
Pixel Format	1920 horiz. by 1080 vert. Pixels, RGB stripe arrangement
Color Depth	8-bit, 16.7 M colors (※ 1.06B colors @ 10 bit (D) System Output)
Drive IC Data Interface	Source D-IC : 8-bit mini-LVDS, gamma reference voltage, and control signals Gate D-IC : Line on Glass(LOG) Through Source D-IC
Luminance, White	450 cd/m^2 (Center 1point ,Typ.)
Viewing Angle (CR>10)	Viewing angle free (R/L 178 (Min.), U/D 178 (Min.))
Power Consumption	Total 111.2 W (Typ.) (Logic=18.7 W with T-CON, Backlight=92.5W @ with Driver
Weight	11.1Kg (Typ.)
Display Mode	Transmissive mode, Normally black
Surface Treatment	Hard coating (3H), Anti-glare treatment of the front polarizer (Haze 10%)

2. Absolute Maximum Ratings

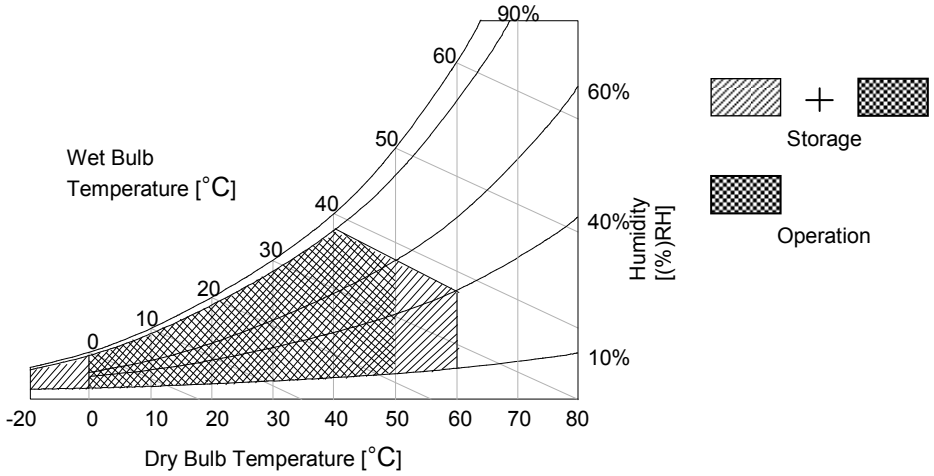
The following items are maximum values which, if exceeded, may cause faulty operation or damage to the LCD module.

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value		Unit	Note
		Min	Max		
Logic Power Voltage	VCC	-0.5	+4.0	VDC	1
Gate High Voltage	VGH	+18.0	+30.0	VDC	
Gate Low Voltage	VGL	-8.0	-4.0	VDC	
Source D-IC Analog Voltage	VDD	-0.3	+18.0	VDC	
Gamma Ref. Voltage (Upper)	VGMH	½VDD-0.5	VDD+0.5	VDC	
Gamma Ref. Voltage (Low)	VGML	-0.3	½ VDD+0.5	VDC	
LED Input Voltage	Vf	-	+180.0	VDC	
Panel Front Temperature	TSUR	-	+68	°C	4
Operating Temperature	TOP	0	+50	°C	2,3
Storage Temperature	TST	-20	+60	°C	
Operating Ambient Humidity	HOP	10	90	%RH	
Storage Humidity	HST	10	90	%RH	

Note: 1. Ambient temperature condition (Ta = 25 ± 2 °C)

2. Temperature and relative humidity range are shown in the figure below. Wet bulb temperature should be Max 39 °C and no condensation of water.
3. Gravity mura can be guaranteed below 40℃ condition.
4. The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 68 ℃ with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 68 ℃. The range of operating temperature may degrade in case of improper thermal management in final product design.



3. Electrical Specifications

3-1. Electrical Characteristics

It requires several power inputs. The VCC is the basic power of LCD Driving power sequence, Which is used to logic power voltage of Source D-IC and Gate D-IC.

Table 2. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Condition	MIN	TYP	MAX	Unit	Note
Logic Power Voltage	VCC	-	3.0	3.3	3.6	VDC	
Logic High Level Input Voltage	VIH		2.3		VCC	VDC	
Logic Low Level Input Voltage	VIL		0		0.8	VDC	
Source D-IC Analog Voltage	VDD	-	16.0	16.2	16.4	VDC	
Half Source D-IC Analog Voltage	H_VDD	-	7.85	8.1	8.35	VDC	
Gamma Reference Voltage	V_{GMH}	(GMA1 ~ GMA9)	½*VDD		VDD-0.2		
	V_{GML}	(GMA10 ~ GMA18)	0.2		½*VDD		
Common Voltage	Vcom	-	5.75	6.05	6.35	V	
Mini-LVDS Clock frequency	CLK	3.0V≤VCC ≤3.6V			312	MHz	
mini-LVDS input Voltage (Center)	VIB	Mini-LVDS Clock and Data	0.7 + (VID/2)		(VCC-1.2) − VID / 2	V	5
mini-LVDS input Voltage Distortion (Center)	ΔVIB				0.8	V	
mini-LVDS differential Voltage range	VID		150		800	mV	
mini-LVDS differential Voltage range Dip	ΔVID		25		800	mV	
Gate High Voltage	VGH		26.7	27.0(TBD)	27.3	VDC	
Gate Low Voltage	VGL		-5.2	-5.0(TBD)	-4.8	VDC	
Gate High Modulation Voltage	VGHM	-	-	16.5	-	VDC	Fig.1
Total Power Current	ILCD	-	-	1,555		mA	1,2
Total Power Consumption	PLCD	-	-	18.66		Watt	

Note: 1. The specified current and power consumption are under the V_{LCD}=12V., 25 ± 2°C, f_V=240Hz condition whereas mosaic pattern(8 x 6) is displayed and f_V is the frame frequency.
2. The above spec is based on the basic model.
3. All of the typical gate voltage should be controlled within 1% voltage level
4. Ripple voltage level is recommended under 10%
5. In case of mini-LVDS signal spec, refer to Fig 2 for the more detail.
6. Logic level Input Signal : SOE, POL, GSP, H_CONV, OPT_N
7. HVDD Voltage level is half of VDD and it should be between Gamma9 and Gamma10

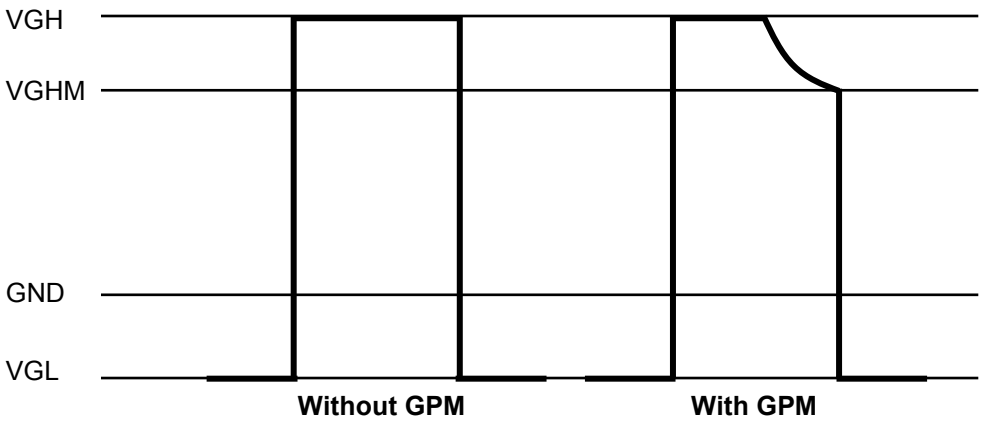


FIG. 1 Gate Output Wave form without GPM and with GPM

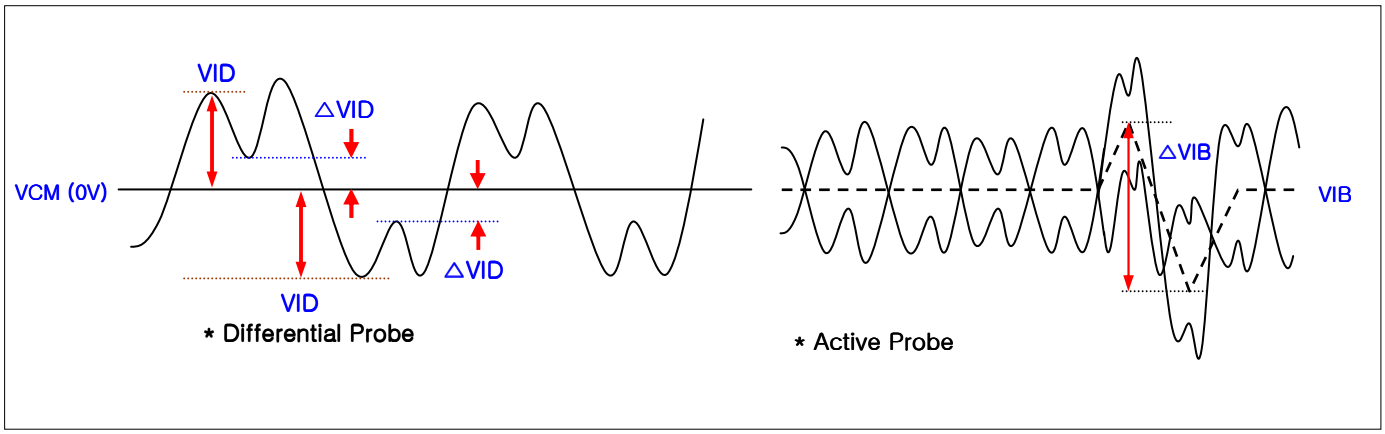


FIG. 2 Description of VID, ΔVIB, ΔVID

* Source PCB

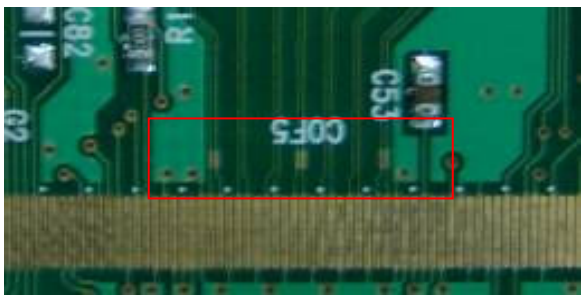


FIG. 3 Measure point

Table 3. ELECTRICAL CHARACTERISTICS (Continue)

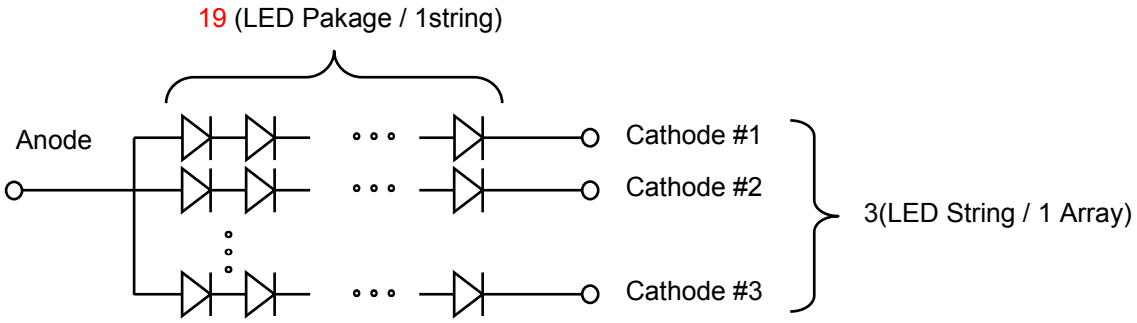
Parameter		Symbol	Values			Unit	Note
			Min	Typ	Max		
Backlight Assembly :							
Forward Current (one array)	Anode	$I_{F\ (anode)}$		165		mAdc	±5%
				384		mAdc	3D Mode
	Cathode	$I_{F\ (cathode)}$	52.25	55	57.75	mAdc	±5%
			121.6	128	134.4	mAdc	3D Mode
Forward Voltage		V_F	118.2	123.4	128.5	Vdc	
			131.0	136.3	141.6	Vdc	3D Mode
Forward Voltage Variation		$\triangle V_F$			1.7	Vdc	
Power Consumption		P_{BL}		81.4	84.8	W	
				35.6	37.0	W	3D Mode
Burst Dimming Duty		On duty	1		100	%	
			1		30	%	3D Mode
Burst Dimming Frequency		1/T	95		252	Hz	
LED Array : (APPENDIX-V)							
Life Time			30,000			Hrs	

Notes :

The design of the LED driver must have specifications for the LED array in LCD Assembly.
The electrical characteristics of LED driver are based on Constant Current driving type.
The performance of the LED in LCM, for example life time or brightness, is extremely influenced by the characteristics of the LED Driver. So, all the parameters of an LED driver should be carefully designed.
When you design or order the LED driver, please make sure unwanted lighting caused by the mismatch of the LED and the driver (no lighting, flicker, etc) has never been occurred. When you confirm it, the LCD–Assembly should be operated in the same condition as installed in your instrument.

Notes :

1. Electrical characteristics are based on LED Array specification.
2. Specified values are defined for a Backlight Assembly. (IBL : 4 LED array, 165mA/LED array)
3. Each LED array has one anode terminal and three cathode terminals.
   The forward current(I_F) of the anode terminal is 165mA and it supplies 55mA into three strings, respectively



4. The forward voltage(V_F) of LED array depends on ambient temperature (Appendix-V)
5. ΔV_F means Max V_F-Min V_F in one Backlight. So V_F variation in a Backlight isn't over Max. 1.7V
6. Maximum level of power consumption is measured at initial turn on.
   Typical level of power consumption is measured after 1hrs aging at 25 ± 2°C.
7. The life time(MTTF) is determined as the time at which brightness of the LED is 50% compared to that of initial value at the typical LED current on condition of continuous operating at 25 ± 2°C, based on duty 100%.
8. The reference method of burst dimming duty ratio.
   It is recommended to use synchronous V-sync frequency to prevent waterfall
   (Vsync x 1 =Burst Frequency)

3-2. Interface Connections

This LCD module employs two kinds of interface connection, two 80-pin FFC connector are used for the module electronics and four 3-pin Balance PCB connectors are used for the integral backlight system.

3-2-1. LCD Module

-LCD Connector (CN1): TF06L-80S-0.5SH (Manufactured by Hirose) or Equivalent

Table 4-1. MODULE CONNECTOR(CN1) PIN CONFIGURATION

No	Symbol	Description	No	Symbol	Description
1	VDD	Driver Power Supply Voltage	41	GND	Ground
2	VDD	Driver Power Supply Voltage	42	POL	Polarity Output Signal
3	GND	Ground	43	GSP	Gate Start Pulse
4	VCC	Logic Power Supply Voltage	44	H_CONV	Horizontal 2 Inversion Signal
5	VCC	Logic Power Supply Voltage	45	OPT_N	"H" Normal Display / "L" Rotation Display
6	GND	Ground	46	GND	Ground
7	HVDD	Half Driver Power Supply Voltage	47	LRV5 -	Left Right Mini LVDS Receiver Signal(5-)
8	HVDD	Half Driver Power Supply voltage	48	LRV5 +	Left Right Mini LVDS Receiver Signal(5+)
9	GND	Ground	49	LRV4 -	Left Right Mini LVDS Receiver Signal(4-)
10	VGL	Gate Low Voltage	50	LRV4 +	Left Right Mini LVDS Receiver Signal(4+)
11	GND	Ground	51	LRV3 -	Left Right Mini LVDS Receiver Signal(3-)
12	GOE	Gate Output Enable	52	LRV3 +	Left Right Mini LVDS Receiver Signal(3+)
13	GSC	Gate Shift Clock	53	GND	Ground
14	GND	Ground	54	LRVCLK -	Left Right Mini LVDS Receiver Clock(-)
15	VGH	Gate High Voltage	55	LRVCLK +	Left Right Mini LVDS Receiver Clock(+)
16	GND	Ground	56	GND	Ground
17	LVCOM_FB	Vcom Feedback	57	LRV2 -	Left Right Mini LVDS Receiver Signal(2-)
18	VCOM_L	Left Vcom Output	58	LRV2 +	Left Right Mini LVDS Receiver Signal(2+)
19	GND	Ground	59	LRV1 -	Left Right Mini LVDS Receiver Signal(1-)
20	ZOUT	LTD Output	60	LRV1 +	Left Right Mini LVDS Receiver Signal(1+)
21	GND	Ground	61	LRV0 -	Left Right Mini LVDS Receiver Signal(0-)
22	GND	Ground	62	LRV0 +	Left Right Mini LVDS Receiver Signal(0+)
23	GMA18	Gamma Voltage 18	63	GND	Ground
24	GMA17	Gamma Voltage 17	64	LLV5 -	Left Left Mini LVDS Receiver Signal(5-)
25	GMA16	Gamma Voltage 16	65	LLV5 +	Left Left Mini LVDS Receiver Signal(5+)
26	GMA15	Gamma Voltage 15	66	LLV4 -	Left Left Mini LVDS Receiver Signal(4-)
27	GMA14	Gamma Voltage 14	67	LLV4 +	Left Left Mini LVDS Receiver Signal(4+)
28	GMA13	Gamma Voltage 13	68	LLV3 -	Left Left Mini LVDS Receiver Signal(3-)
29	GMA12	Gamma Voltage 12	69	LLV3 +	Left Left Mini LVDS Receiver Signal(3+)
30	GMA10	Gamma Voltage 10	70	GND	Ground
31	GMA9	Gamma Voltage 9	71	LLVCLK -	Left Left Mini LVDS Receiver Clock(-)
32	GMA7	Gamma Voltage 7	72	LLVCLK +	Left Left Mini LVDS Receiver Clock(+)
33	GMA6	Gamma Voltage 6	73	GND	Ground
34	GMA5	Gamma Voltage 5	74	LLV2 -	Left Left Mini LVDS Receiver Signal(2-)
35	GMA4	Gamma Voltage 4	75	LLV2 +	Left Left Mini LVDS Receiver Signal(2+)
36	GMA3	Gamma Voltage 3	76	LLV1 -	Left Left Mini LVDS Receiver Signal(1-)
37	GMA2	Gamma Voltage 2	77	LLV1 +	Left Left Mini LVDS Receiver Signal(1+)
38	GMA1	Gamma Voltage 1	78	LLV0 -	Left Left Mini LVDS Receiver Signal(0-)
39	GND	Ground	79	LLV0 +	Left Left Mini LVDS Receiver Signal(0+)
40	SOE	Source Output Enable	80	GND	Ground

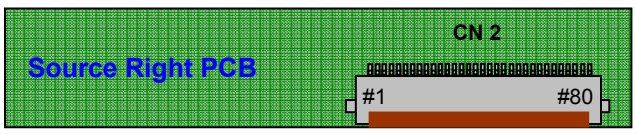
Note : 1. Please refer to application note for details (**Half VDD & Gamma Voltage setting**).

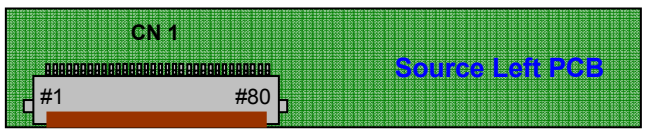
-LCD Connector (CN2): TF06L-80S-0.5SH (Manufactured by Hirose) or Equivalent

Table 4-2. MODULE CONNECTOR(CN2) PIN CONFIGURATION

No	Symbol	Description	No	Symbol	Description
1	GND	Ground	41	GSP	Gate Start Pulse
2	RRV5 -	Right Right Mini LVDS Receiver Signal(5-)	42	GND	Ground
3	RRV5 +	Right Right Mini LVDS Receiver Signal(5+)	43	GMA 18	Gamma Voltage 18
4	RRV4 -	Right Right Mini LVDS Receiver Signal(4-)	44	GMA 17	Gamma Voltage 17
5	RRV4 +	Right Right Mini LVDS Receiver Signal(4+)	45	GMA 16	Gamma Voltage 16
6	RRV3 -	Right Right Mini LVDS Receiver Signal(3-)	46	GMA 15	Gamma Voltage 15
7	RRV3 +	Right Right Mini LVDS Receiver Signal(3+)	47	GMA 14	Gamma Voltage 14
8	GND	Ground	48	GMA 13	Gamma Voltage 13
9	RRVCLK -	Right Right Mini LVDS Receiver Clock(-)	49	GMA 12	Gamma Voltage 12
10	RRVCLK +	Right Right Mini LVDS Receiver Clock(+)	50	GMA 10	Gamma Voltage 10
11	GND	Ground	51	GMA 9	Gamma Voltage 9
12	RRV2 -	Right Right Mini LVDS Receiver Signal(2-)	52	GMA 7	Gamma Voltage 7
13	RRV2 +	Right Right Mini LVDS Receiver Signal(2+)	53	GMA 6	Gamma Voltage 6
14	RRV1 -	Right Right Mini LVDS Receiver Signal(1-)	54	GMA 5	Gamma Voltage 5
15	RRV1 +	Right Right Mini LVDS Receiver Signal(1+)	55	GMA 4	Gamma Voltage 4
16	RRV0 -	Right Right Mini LVDS Receiver Signal(0-)	56	GMA 3	Gamma Voltage 3
17	RRV0 +	Right Right Mini LVDS Receiver Signal(0+)	57	GMA 2	Gamma Voltage 2
18	GND	Ground	58	GMA 1	Gamma Voltage 1
19	RLV5 -	Right Left Mini LVDS Receiver Signal(5-)	59	GND	Ground
20	RLV5 +	Right Left Mini LVDS Receiver Signal(5+)	60	ZOUT	LTD Output
21	RLV4 –	Right Left Mini LVDS Receiver Signal(4-)	61	GND	Ground
22	RLV4 +	Right Left Mini LVDS Receiver Signal(4+)	62	VCOM_R	Right Vcom Output
23	RLV3 -	Right Left Mini LVDS Receiver Signal(3-)	63	RVCOM_FB	NC(TBD)
24	RLV3 +	Right Left Mini LVDS Receiver Signal(3+)	64	GND	Ground
25	GND	Ground	65	VGH	Gate High Voltage
26	RLVCLK -	Right Left Mini LVDS Receiver Clock(-)	66	GND	Ground
27	RLVCLK +	Right Left Mini LVDS Receiver Clock(+)	67	GSC	Gate Shift Clock
28	GND	Ground	68	GOE	Gate Output Enable
29	RLV2 -	Right Left Mini LVDS Receiver Signal(2-)	69	GND	Ground
30	RLV2 +	Right Left Mini LVDS Receiver Signal(2+)	70	VGL	Gate Low Voltage
31	RLV1 -	Right Left Mini LVDS Receiver Signal(1-)	71	OPT_P	“L” Normal Display / “H” Rotation Display
32	RLV1 +	Right Left Mini LVDS Receiver Signal(1+)	72	GND	Ground
33	RLV0 -	Right Left Mini LVDS Receiver Signal(0-)	73	HVDD	Half Driver Power Supply Voltage
34	RLV0 +	Right Left Mini LVDS Receiver Signal(0+)	74	HVDD	Half Driver Power Supply voltage
35	GND	Ground	75	GND	Ground
36	OPT_N	“H” Normal Display / “L” Rotation Display	76	VCC	Logic Power Supply Voltage
37	H_CONV	Horizontal 2 Inversion Signal	77	VCC	Logic Power Supply Voltage
38	SOE	Source Output Enable	78	GND	Ground
39	GND	Ground	79	VDD	Driver Power Supply Voltage
40	POL	Polarity Output Signal	80	VDD	Driver Power Supply Voltage

Note : 1. Please refer to application note for details (Half VDD & Gamma Voltage setting).





3-2-2. Backlight Module

[CN1]

1) LED Array assy Connector (Plug)

: 20010HS-12 (manufactured by Yeonho) or equivalent

2) Mating Connector (Receptacle)

: 20010WR-12 (manufactured by Yeonho) or equivalent

[CN2]

1) LED Array assy Connector (Plug)

: 20010HS-13 B(BK)(manufactured by Yeonho) or equivalent

2) Mating Connector (Receptacle)

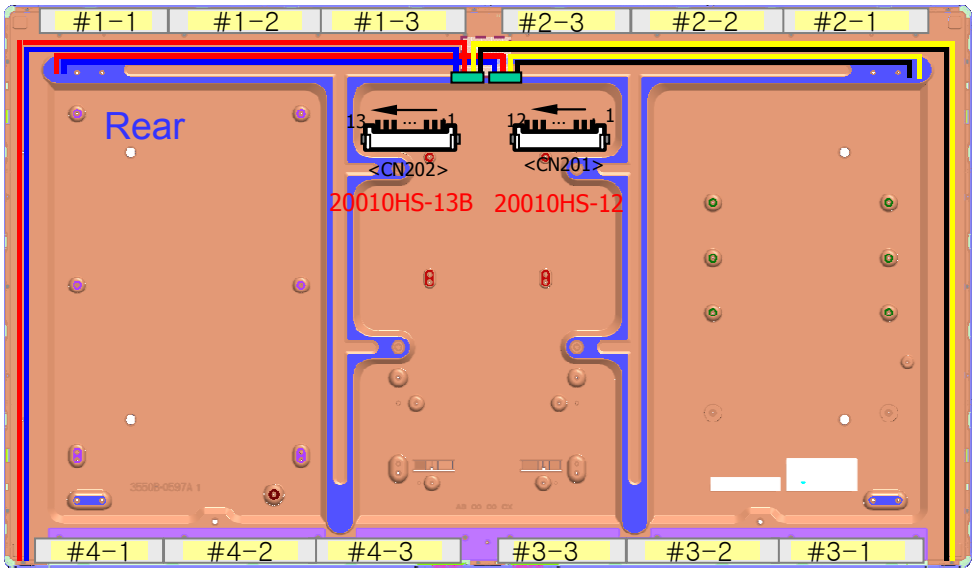
: 20010WR-13 (manufactured by Yeonho) or equivalent

Table 5. BACKLIGHT CONNECTOR PIN CONFIGURATION(CN1,CN2)

No	Symbol	Description	Note
1	#1 Anode	LED Input Current	
2	N.C	Open	
3	#1-1 Cathode	LED Output Current	
4	#1-2 Cathode	LED Output Current	
5	#1-3 Cathode	LED Output Current	
6	N.C	Open	
7	N.C	Open	
8	#2-3Cathode	LED Output Current	
9	#2-2 Cathode	LED Output Current	
10	#2-1 Cathode	LED Output Current	
11	N.C	Open	
12	#2 Anode	LED Input Current	

No	Symbol	Description	Note
1	#3 Anode	LED Input Current	
2	N.C	Open	
3	#3-1 Cathode	LED Output Current	
4	#3-2 Cathode	LED Output Current	
5	#3-3 Cathode	LED Output Current	
6	N.C	Open	
7	N.C	Open	
8	N.C	Open	
9	#4-3Cathode	LED Output Current	
10	#4-2 Cathode	LED Output Current	
11	#4-1 Cathode	LED Output Current	
12	N.C	Open	
13	#4 Anode	LED Input Current	

◆ **Rear view of LCM**



3-3. Signal Timing Specifications

Table 6. Timing Requirements

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Mini Clock pulse period	T_1		3.2	3.4		ns	1
Mini Clock pulse low period	T_2		1.6	-	-	ns	
Mini Clock pulse high period	T_3		1.6	-	-	ns	
Mini Data setup time	T_6		0.60	-	-	ns	
Mini Data hold time	T_7		0.60	-	-	ns	
Reset low to SOE rising time	T_8		0	-	-	ns	
SOE to Reset input time	T_9		200	-	-	ns	
Receiver off to SOE timing	T_{10}		10	-	-	CLK cycle	
POL signal to SOE setup time	T_{11}		-5	-	-	ns	
POL signal to SOE hold time	T_{12}		6	-	-	ns	
Reset High Period	T_{13}		3			CLK cycle	
SOE signal GSP setup time	T_{14}		100			ns	
SOE signal GSP Hold time	T_{15}		100			ns	
SOE signal Pulse Width	T_{16}		200			ns	

Note : 1. mini-LVDS timing measure conditions:
: 268 MHz < Clock Frequency <312 MHz , 150mV < VID < 800mV @ 3.0< VCC <3.3
2. Setup time and hold time should be satisfied at the same time

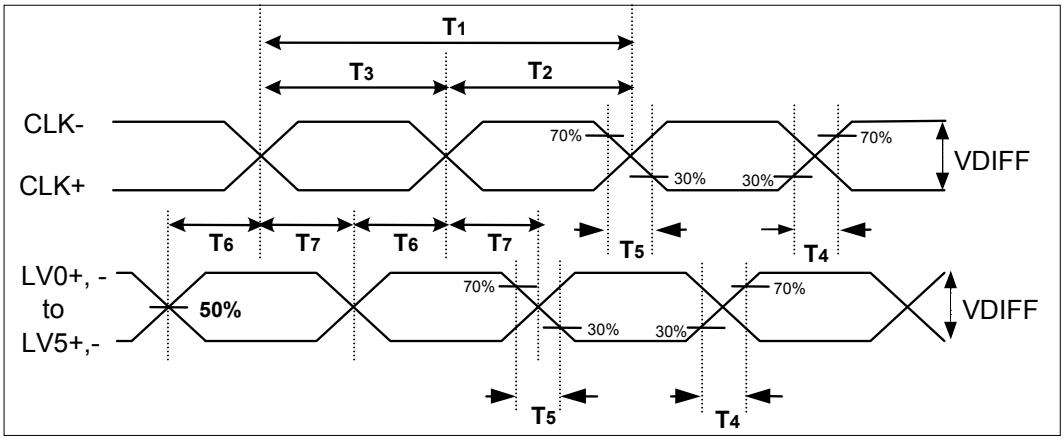


FIG 4. Source D-IC Input Data Latch Timing Waveform

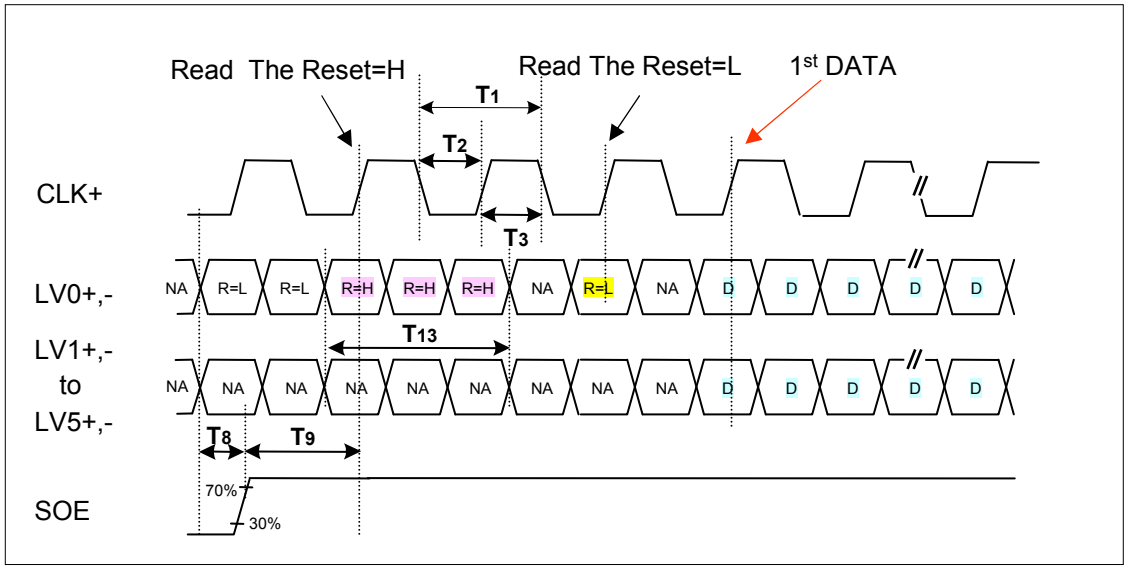


FIG 5-1. Input Data Timing for 1st Source D-IC Chip

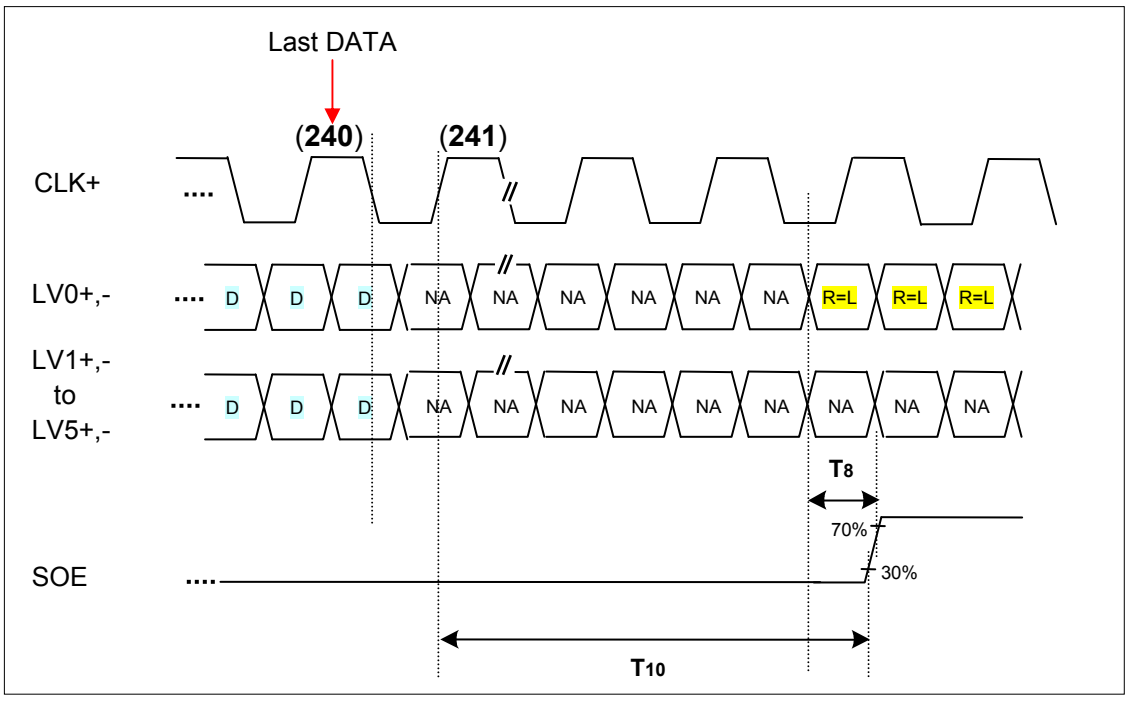


FIG 5-2. Last Data Latch to SOE Timing

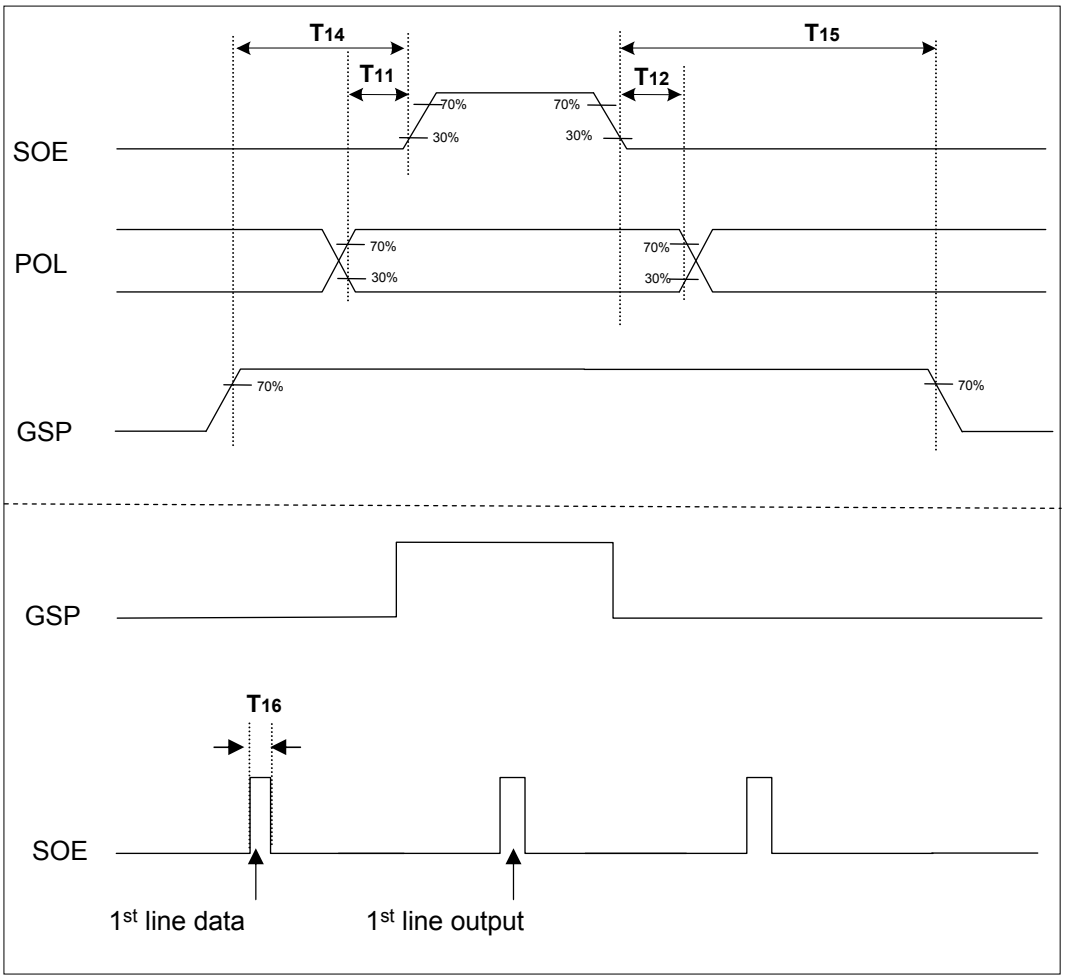
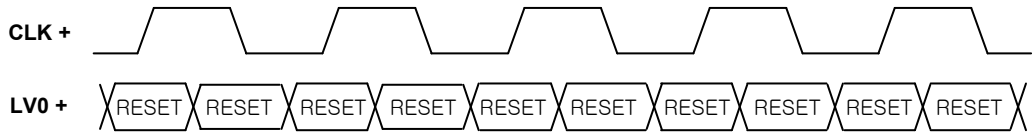


FIG 6. POL, GSP and SOE Timing Waveform

3-4. Data Mapping and Timing

Display data and control signal (RESET) are input to **LV0** to **LV5**.

3-4-1. Control signal input mode



3-4-2. Display data input mode

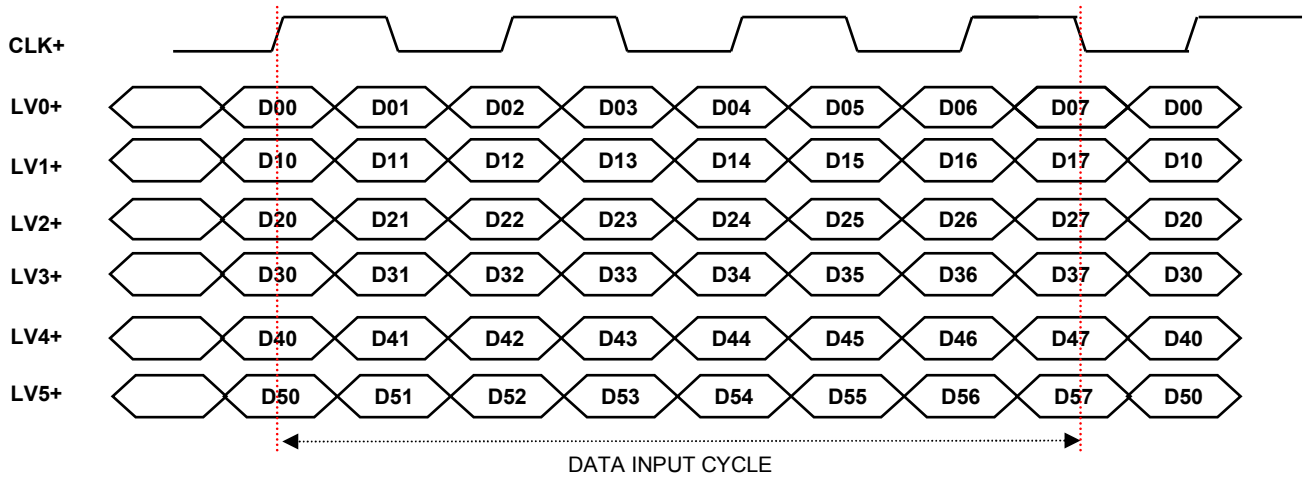


Fig. 7 Mini-LVDS Data

Note : 1. For data mapping, please refer to panel pixel structure Fig.8

3-5. Panel Pixel Structure

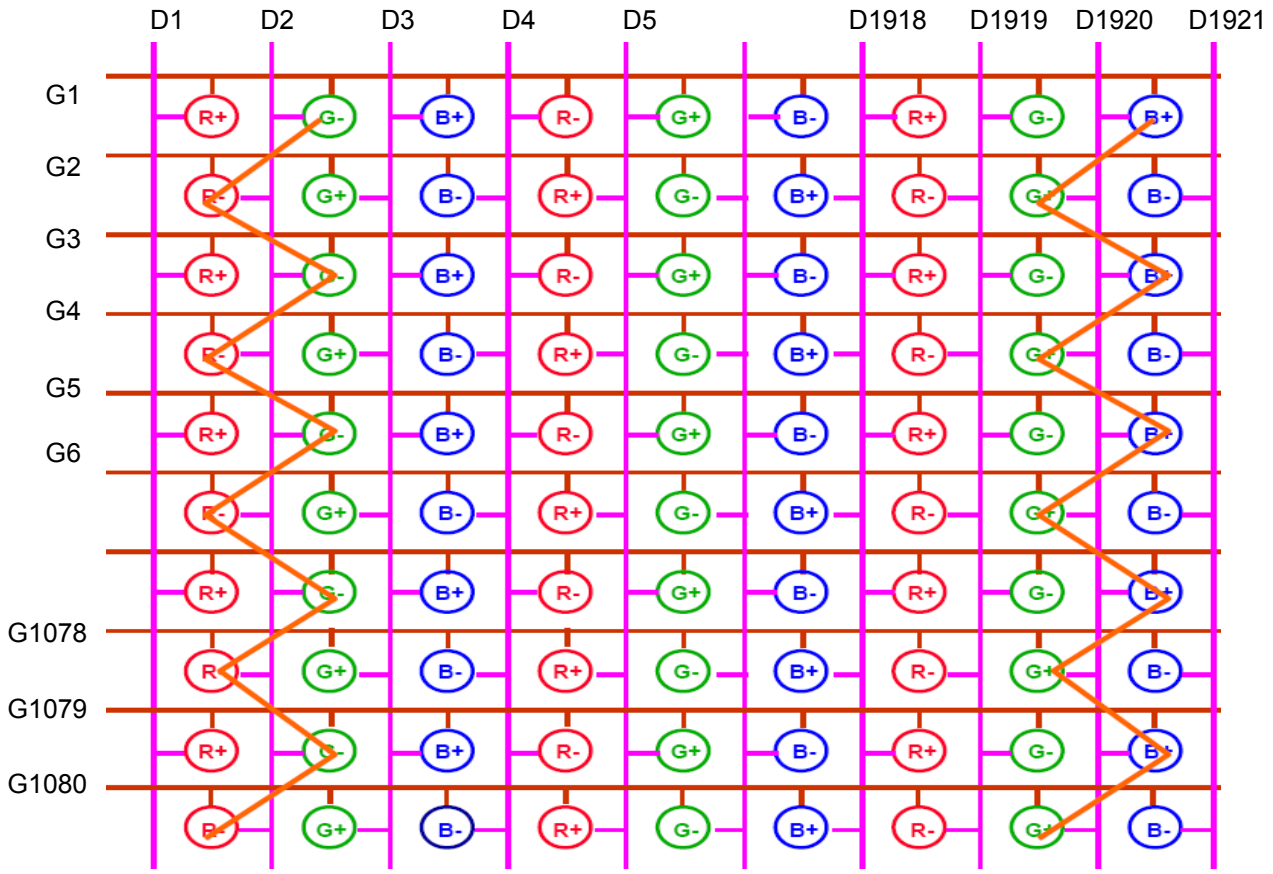


FIG. 8 Panel Pixel Structure

3-6. Power Sequence

3-6-1. LCD Driving circuit

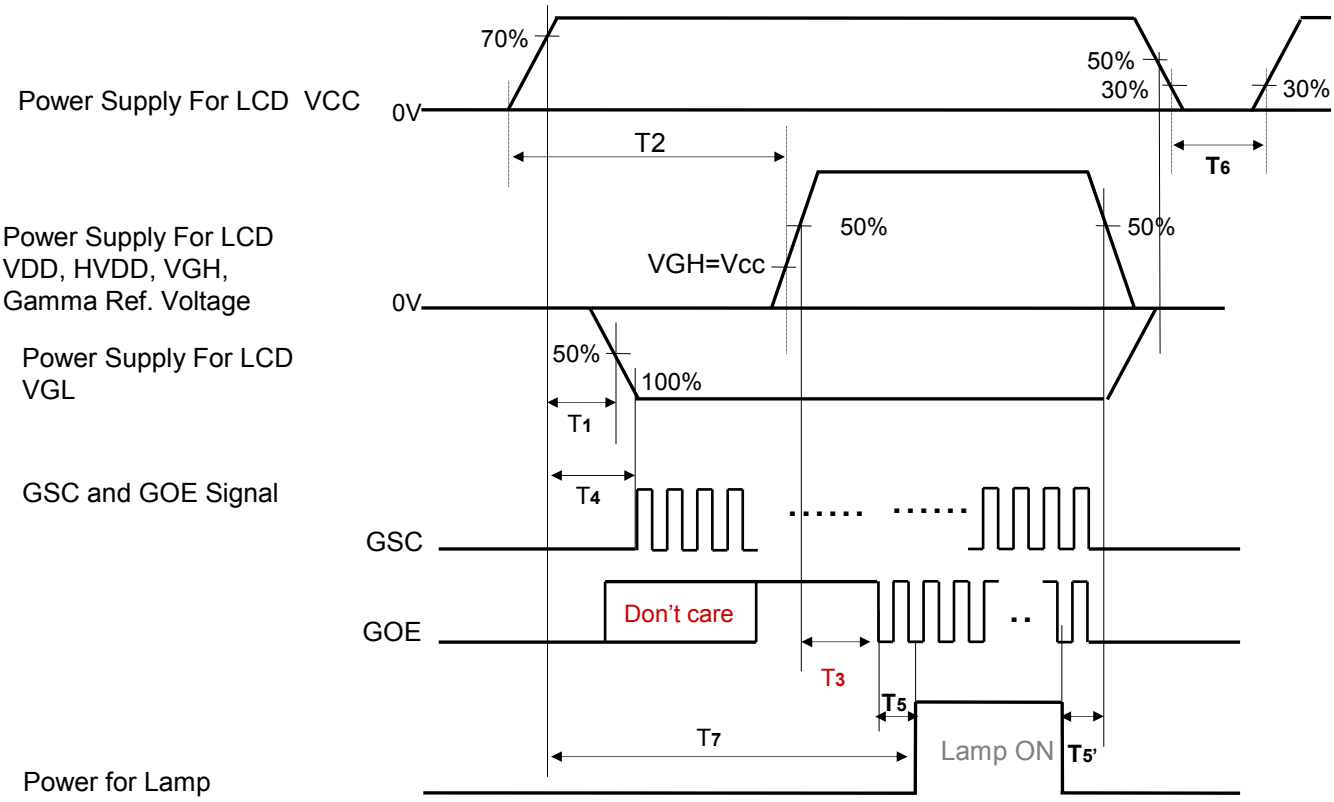


Table 7. POWER SEQUENCE

Parameter	Value			Unit	Notes
	Min	Typ	Max		
T_1	0.5		-	ms	
T_2	0.01		-	ms	
T_3	10		-	ms	
T_4	0		T2	ms	
T_5 / T_5'	20		-	ms	
T_6	2		-	sec	
T_7	0.5		-	s	

Note : 1. Power sequence for Source D-IC must be kept. ※ Please refer to Appendix IV for more details
2. The Gate D-IC power on sequence must be VCC, VGL, logic input & VGH.
3. The 1st start of GSC is located between VGL and VGH.
4. GOE rising is before GSC.
5. Power off sequence order is reverse of power on sequence.

4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable in a dark environment at 25±2°C. The values are specified at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0 °.
It is presented additional information concerning the measurement equipment and method in FIG. 9.

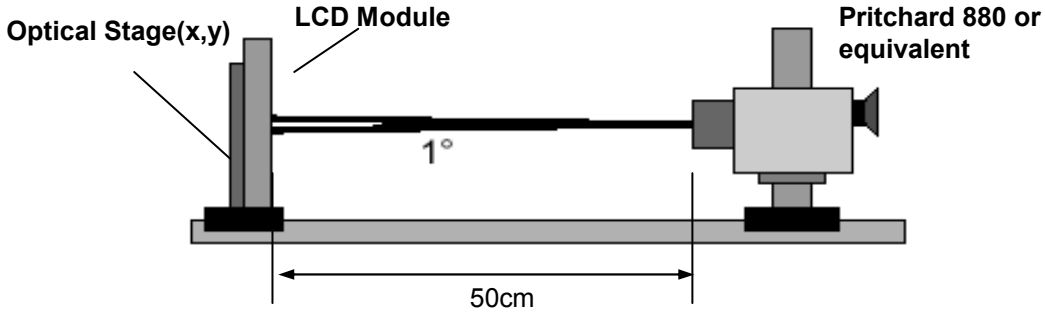


FIG. 9 Optical Characteristic Measurement Equipment and Method

Ta= 25±2°C, VDD,H_VDD,VGH,VGL=typ,
fV=240Hz, Clk=297MHz, I_F =165 mA (Typ.)

Table 8. OPTICAL CHARACTERISTICS

Parameter		Symbol	Value			Unit	Note
			Min	Typ	Max		
Contrast Ratio		CR	900	1300	-		1
Surface Luminance, white		L_{WH}	360	450	-	cd/m^2	2
Luminance Variation		δ_{WHITE} 5P	-	-	1.3		3
Response Time	Rising	Tr	-	6		ms	4
	Falling	Tf	-	6			
Color Coordinates [CIE1931]	RED	Rx	Typ -0.03	0.642	Typ +0.03		
		Ry		0.335			
	GREEN	Gx		0.308			
		Gy		0.602			
	BLUE	Bx		0.156			
		By		0.061			
	WHITE	Wx		0.279			
		Wy		0.292			
Color Temperature				10,000		K	
Color Gamut				72		%	NTSC
Viewing Angle (CR>10)							
	x axis, right(ϕ=0°)	θr	89	-	-	degree	5
	x axis, left (ϕ=180°)	θl	89	-	-		
	y axis, up (ϕ=90°)	θu	89	-	-		
	y axis, down (ϕ=270°)	θd	89	-	-		
Gray Scale			-	-	-		6

Note : 1. Contrast Ratio(CR) is defined mathematically as :

$$CR = \frac{\text{Surface Luminance at all white pixels}}{\text{Surface Luminance at all black pixels}}$$

It is measured at center 1-point.

2. Surface luminance is determined after the unit has been 'ON' and 1Hour after lighting the backlight in a dark environment at 25±2°C. Surface luminance is the luminance value at center 1-point across the LCD surface 50cm from the surface with all pixels displaying white. For more information see the FIG. 10.

3. The variation in surface luminance , δ WHITE is defined as :
δ WHITE(5P) = Maximum(L_{on1},L_{on2}, L_{on3}, L_{on4}, L_{on5}) / Minimum(L_{on1},L_{on2}, L_{on3}, L_{on4}, L_{on5})
Where L_{on1} to L_{on5} are the luminance with all pixels displaying white at 5 locations .
For more information, see the FIG. 10.

4. Response time is the time required for the display to transit from G(255) to G(0) (Rise Time, Tr_R) and from G(0) to G(255) (Decay Time, Tr_D).

5. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD module surface. For more information, see the FIG. 12.

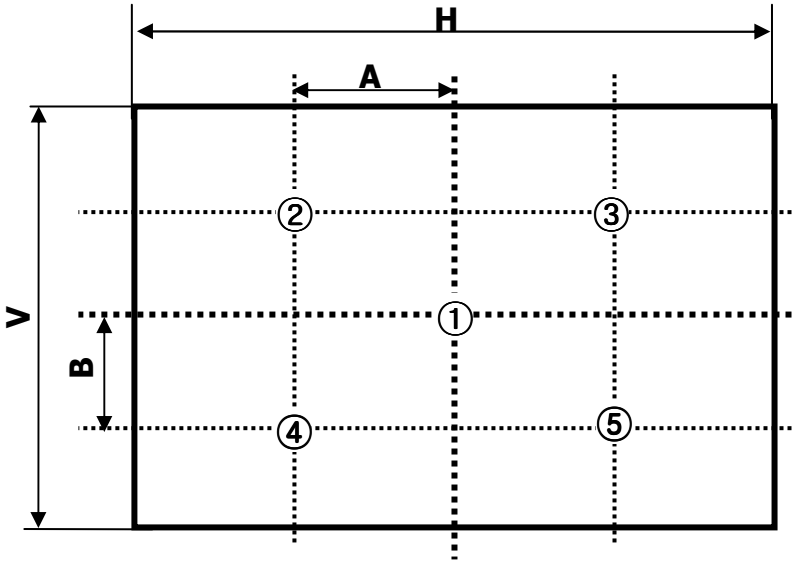
6. Gray scale specification
Gamma Value is approximately 2.2. For more information, see the Table 9.

Table 9. GRAY SCALE SPECIFICATION

Gray Level	Luminance [%] (Typ)
L0	0.07
L15	0.24
L31	1.04
L47	2.49
L63	4.68
L79	7.66
L95	11.5
L111	16.1
L127	21.6
L143	28.1
L159	35.4
L175	43.7
L191	53.0
L207	63.2
L223	74.5
L239	86.7
L255	100

	Gray Level	Gamma Ref.
Positive Voltage	L0	Gamma9
	L31	Gamma7
	L63	Gamma6
	L127	Gamma5
	L191	Gamma4
	L223	Gamma3
	L254	Gamma2
	L255	Gamma1
Negative Voltage	L255	Gamma18
	L254	Gamma17
	L223	Gamma16
	L191	Gamma15
	L127	Gamma14
	L63	Gamma13
	L31	Gamma12
	L0	Gamma10

Measuring point for surface luminance & luminance variation



A : H / 4 mm
B : V / 4 mm
@ H,V : Active Area

FIG.10 5 Points for Luminance Measure

Response time is defined as the following figure and shall be measured by switching the input signal for "Gray(N)" and "Gray(M)".

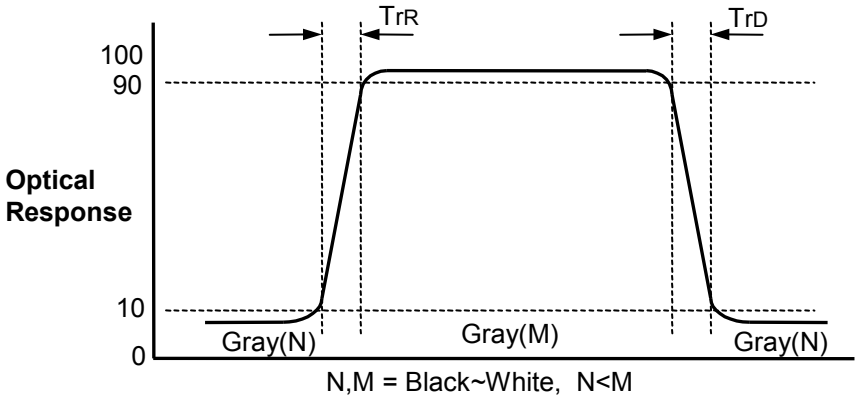


FIG.11 Response Time

Dimension of viewing angle range

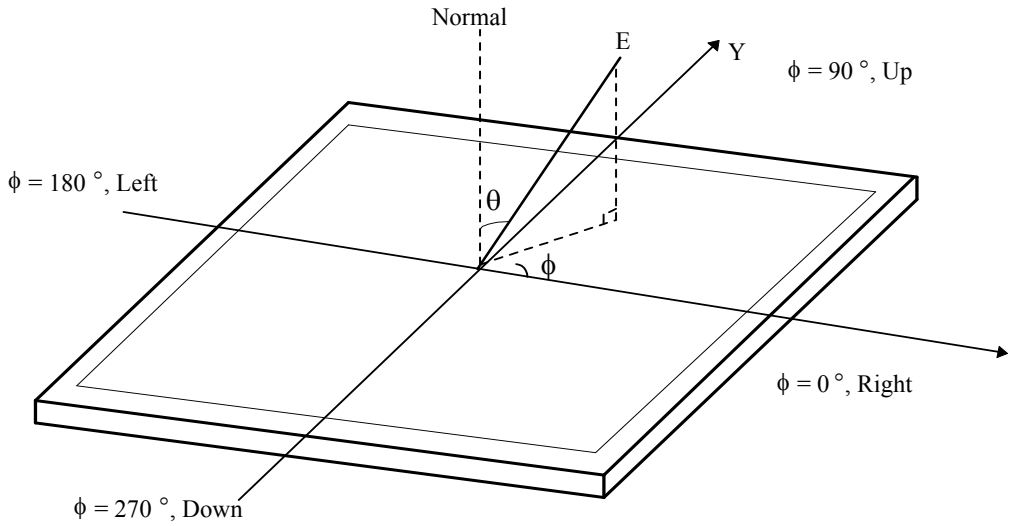


FIG.12 Viewing Angle

5. Mechanical Characteristics

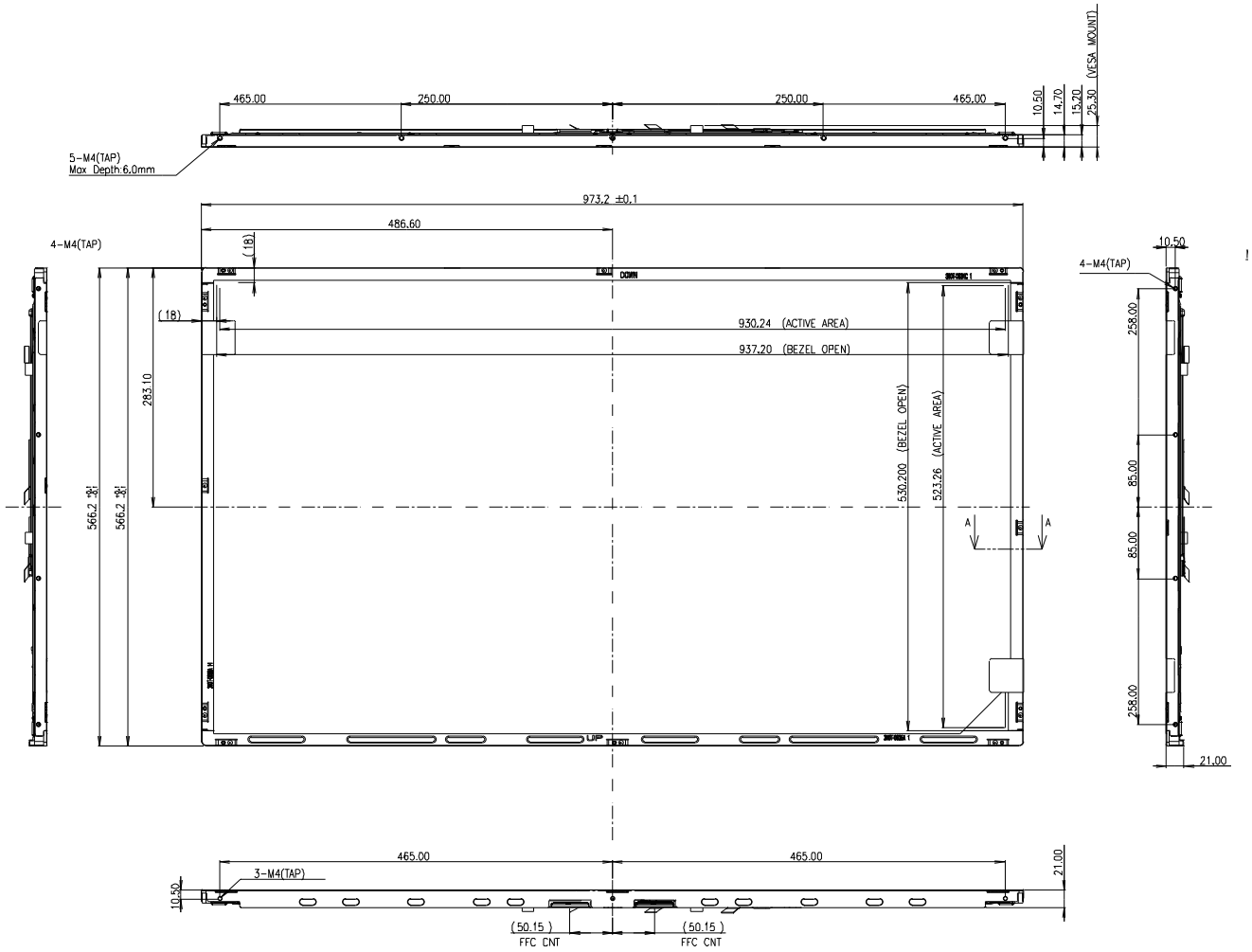
Table 10 provides general mechanical characteristics.

Table 10. MECHANICAL CHARACTERISTICS

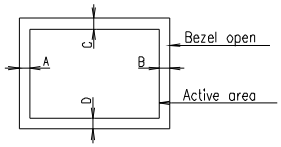
Item	Value	
Outline Dimension	Horizontal	973.2 mm
	Vertical	566.2 mm
	Depth	10.8 mm
Bezel Area	Horizontal	937.2 mm
	Vertical	530.2 mm
Active Display Area	**Horizontal**	**930.24 mm**
	Vertical	**523.26 mm**
Weight	11.1 Kg	

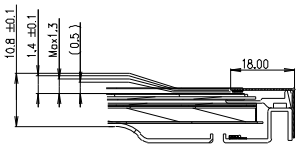
Note : Please refer to a mechanical drawing in terms of tolerance at the next page.

[FRONT VIEW]



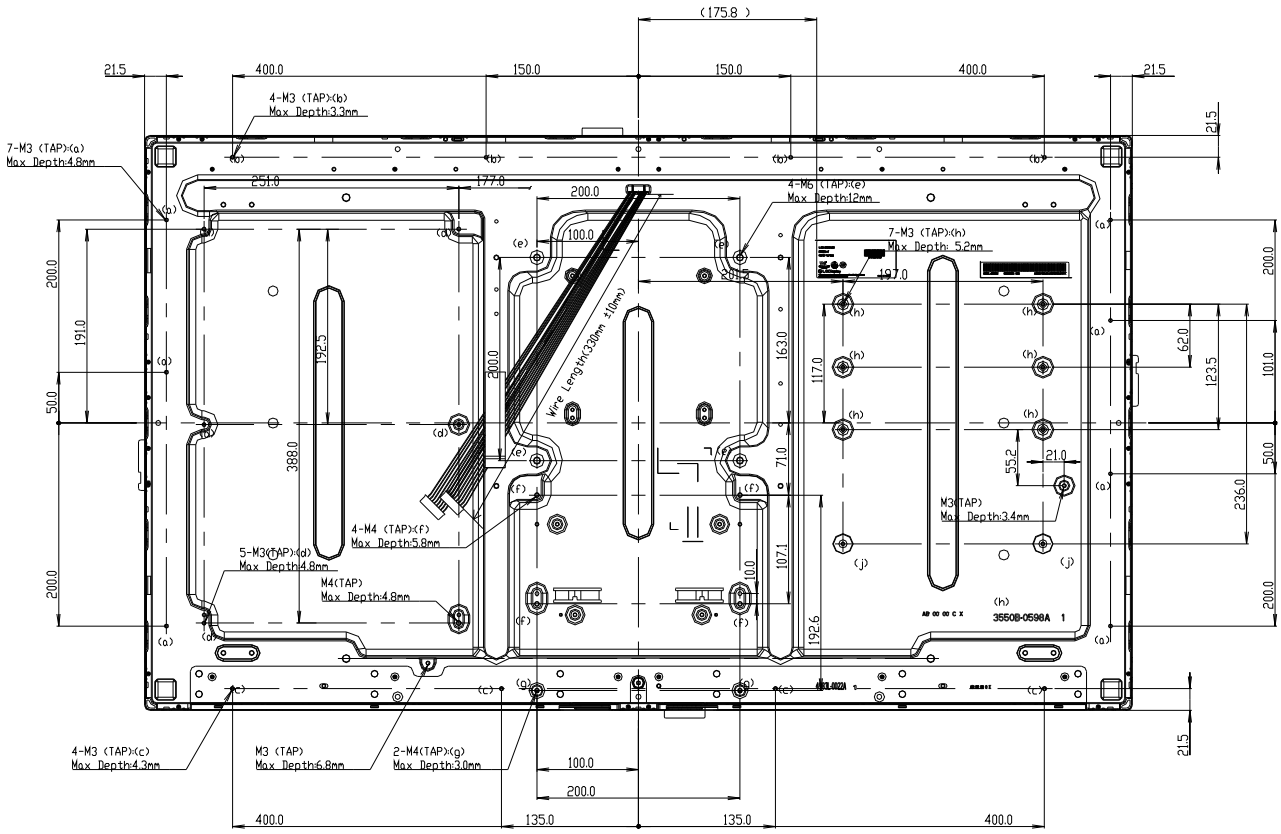
NOTES.
1.UNSPECIFIED TOLERANCE IS ±1.0MM
2.TILT AND PARTIAL DISPOSITION TOLERANCE OF DISPLAY AREA AS FOLLOWING.
(1) Y-DIRECTION: | A-B | ≤ 1.5
(2) X-DIRECTION: | C-D | ≤ 1.5
3.M3.0,M4.0 TAP: Max Torque 6kgf.cm





SECTION A-A
SCALE 1/1

[REAR VIEW]


(175.8)
21.5
400.0
150.0
150.0
400.0
21.5
4-M3 (TAP)x(b)
Max Depth:3.3mm
7-M3 (TAP)x(a)
Max Depth:4.8mm
251.0
177.0
200.0
4-M6 (TAP)x(e)
Max Depth:12mm
100.0
7-M3 (TAP)x(h)
Max Depth: 5.2mm
197.0
Wire Length(350mm ±10mm)
200.0
191.0
50.0
192.5
388.0
163.0
117.0
71.0
107.1
10.0
192.6
62.0
123.5
101.0
55.2
21.0
236.0
4-M4 (TAP)x(f)
Max Depth:5.8mm
5-M3(TAP)x(d)
Max Depth:4.8mm
M4(TAP)
Max Depth:4.8mm
M3(TAP)
Max Depth:3.4mm
3550B-0598A 1
4-M3 (TAP)x(c)
Max Depth:4.3mm
M3 (TAP)
Max Depth:6.8mm
2-M4(TAP)x(g)
Max Depth:3.0mm
100.0
200.0
400.0
135.0
135.0
400.0

6. Reliability

Table 11. ENVIRONMENT TEST CONDITION

No.	Test Item	Condition
1	High temperature storage test	Ta= 60°C 240h
2	Low temperature storage test	Ta= -20°C 240h
3	High temperature operation test	Ta= 50°C 50%RH 240h
4	Low temperature operation test	Ta= 0°C 240h
5	Vibration test (non-operating)	Wave form : random Vibration level : 1.0Grms Bandwidth : 10-300Hz Duration : X,Y,Z, 30 min Each direction per 10 min
6	Shock test (non-operating)	Shock level : 50Grms Waveform : half sine wave, 11ms Direction : ±X, ±Y, ±Z One time each direction
7	Humidity condition Operation	Ta= 40 °C ,90%RH
8	Altitude operating storage / shipment	0 - 15,000 ft 0 - 40,000 ft

Note : Before and after Reliability test, LCM should be operated with normal function.

7. International Standards

7-1. Safety

a) UL 60065, Seventh Edition, Underwriters Laboratories Inc.
Audio, Video and Similar Electronic Apparatus - Safety Requirements.

b) CAN/CSA C22.2 No.60065:03, Canadian Standards Association.
Audio, Video and Similar Electronic Apparatus - Safety Requirements.

c) EN 60065:2002 + A11:2008, European Committee for Electrotechnical Standardization (CENELEC).
Audio, Video and Similar Electronic Apparatus - Safety Requirements.

d) IEC 60065:2005 + A1:2005, The International Electrotechnical Commission (IEC).
Audio, Video and Similar Electronic Apparatus - Safety Requirements.
(Including report of IEC60825-1:2001 clause 8 and clause 9)

Notes

1. Laser (LED Backlight) Information

Class 1 LED Product IEC60825-1 : 2001 Embedded LED Power (Class 1)

2. Caution
: LED inside.
Class XX laser (LEDs) radiation when open.
Do not open while operating.

7-2. Environment

a) RoHS, Directive 2002/95/EC of the European Parliament and of the council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

8. Packing

8-1. Information of LCM Label

a) Lot Mark

A	B	C	D	E	F	G	H	I	J	K	L	M

A,B,C : SIZE(INCH)
D : YEAR
E : MONTH
F ~ M : SERIAL NO.

Note

1. YEAR

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Mark	1	2	3	4	5	6	7	8	9	0

2. MONTH

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mark	1	2	3	4	5	6	7	8	9	A	B	C

b) Location of Lot Mark

Serial NO. is printed on the label. The label is attached to the backside of the LCD module.
This is subject to change without prior notice.

8-2. Packing Form

a) Package quantity in one pallet : 15 ea

b) Pallet Size : 1140 mm X 990 mm X 125.5mm

9. Precautions

Please pay attention to the followings when you use this TFT LCD module.

9-1. Mounting Precautions

(1) You must mount a module using specified mounting holes (Details refer to the drawings).
(2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
(3) Please attach the surface transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.
(4) You should adopt radiation structure to satisfy the temperature specification.
(5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
(6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics are detrimental to the polarizer.)
(7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(9) Do not open the case because inside circuits do not have sufficient strength.

9-2. Operating Precautions

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage :
V=±200mV(Over and under shoot voltage)
(2) Response time depends on the temperature.(In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer
(4) Be careful for condensation at sudden temperature change.Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.
(7) Please do not give any mechanical and/or acoustical impact to LCM. Otherwise, LCM can't be operated its full characteristics perfectly.
(8) A screw which is fastened up the steels should be a machine screw.
(if not, it can causes conductive particles and deal LCM a fatal blow)
(9) Please do not set LCD on its edge.
(10) The conductive material and signal cables are kept away from LED driver inductor to prevent abnormal display, sound noise and temperature rising.

(12) Partial darkness may happen under the long-term operation of any dimming without power on/off. This phenomenon which disappears naturally after 5 minutes is not a problem about reliability but LCD characteristics.

9-3. Electrostatic Discharge Control

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

9-4. Precautions for Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

9-5. Storage

When storing modules as spares for a long time, the following precautions are necessary.

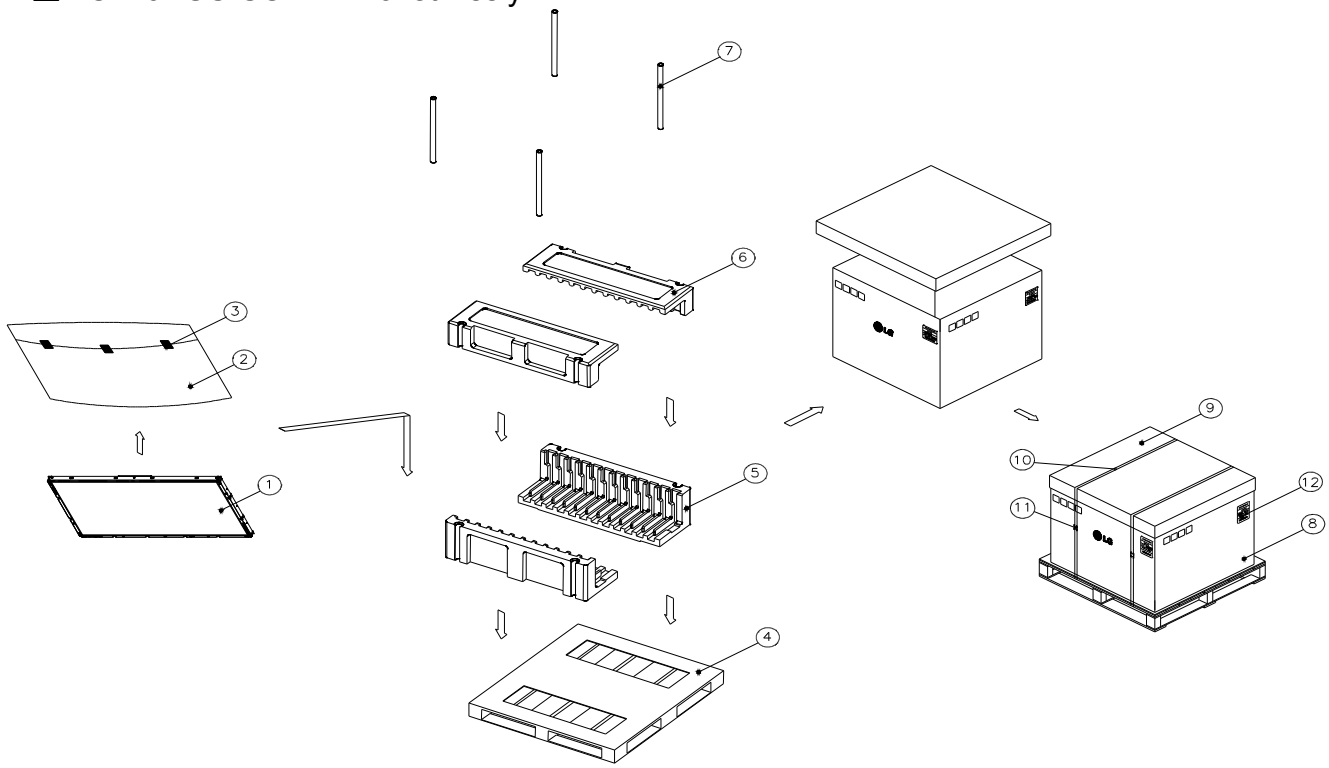
(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
(2) The polarizer surface should not come in contact with any other object.
It is recommended that they be stored in the container in which they were shipped.

9-6. Handling Precautions for Protection Film

(1) The protection film is attached to the bezel with a small masking tape.
When the protection film is peeled off, static electricity is generated between the film and polarizer.
This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
(2) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the bezel after the protection film is peeled off.
(3) You can remove the glue easily. When the glue remains on the bezel surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

APPENDIX-I

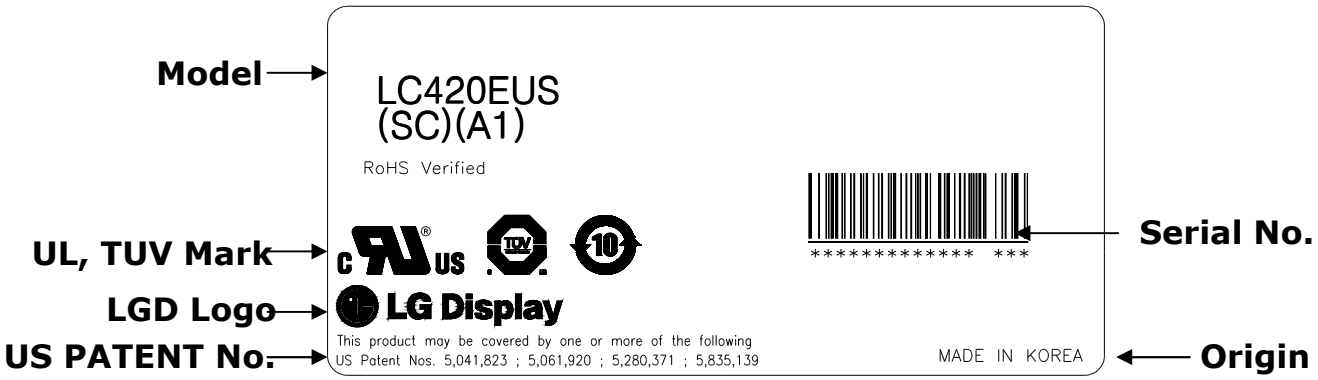
■ LC420EUS-SCA1 – Pallet Ass'y



NO.	DESCRIPTION	MATERIAL
1	LCD Module	
2	BAG	42INCH
3	TAPE	MASKING 20MMX50M
4	PALLET	Plywood 1140X990X125.5mm
5	PACKING,BOTTOM	EPS
6	PACKING,TOP	EPS
7	ANGLE,POST	PAPER
8	ANGLE,PACKING	PAPER
9	ANGLE.COVER	PAPER
10	BAND,CLIP	STEEL or PP
11	BAND	PP
12	LABEL	YUPO 80G 100X70

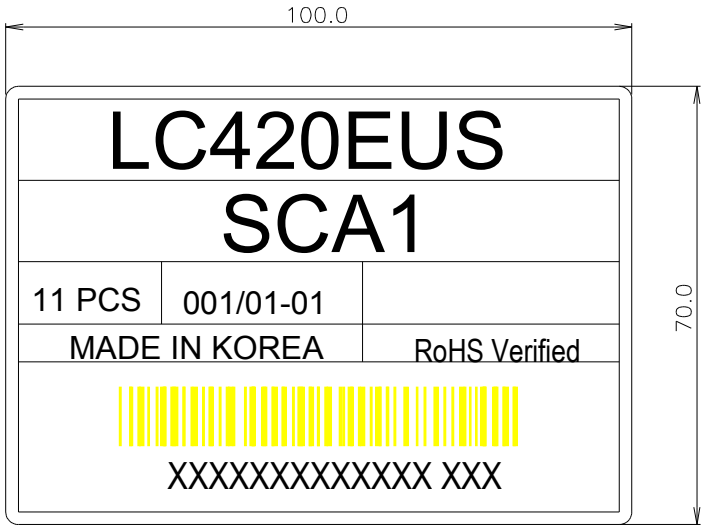
 # APPENDIX- II-1

■ LC420EUS-SCA1-LCM Label



 # APPENDIX- II-2

■ LC420EUS-SCA1-Pallet Label

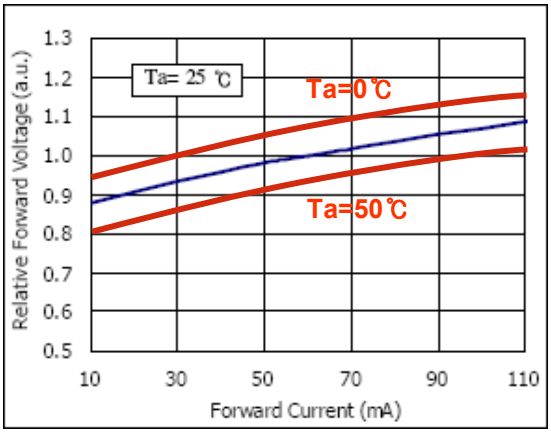


APPENDIX-III

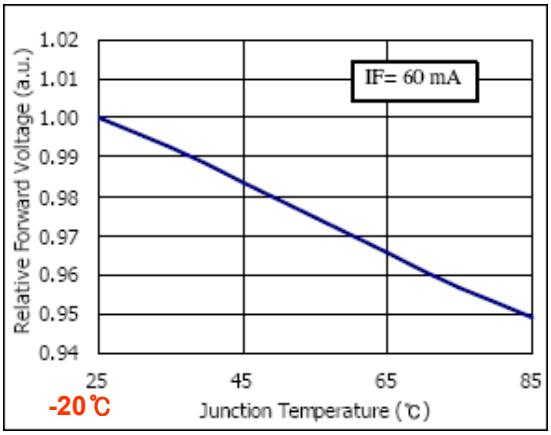
■ LED Array Electrical Spec

No.	ARTICLE	SPECIFICATIONS					
		기호	Min	Typ	Max	단위	NOTE
1	Operating Voltage	Vop	118.2	-	128.5	V	@55mA/String
2	Color Chromaticity	x	0.249	0.259	0.269		@55mA/String
		y	0.207	0.217	0.227		@55mA/String
3	Luminance of White	Iv	11550	12420		nit	@55mA/String
4	White uniformity	Δu'v'		-	0.008		@55mA/String
5	Bright. Uniformity	Bu	87	-		%	@55mA/String
6	Block △Vf	ΔV		-	1.7	V	@55mA/String

■ Forward Current vs. Forward Voltage



■ Ambient Temperature vs. Forward Voltage

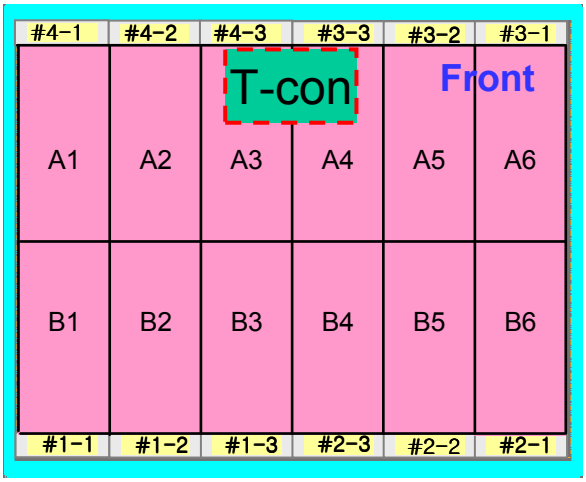


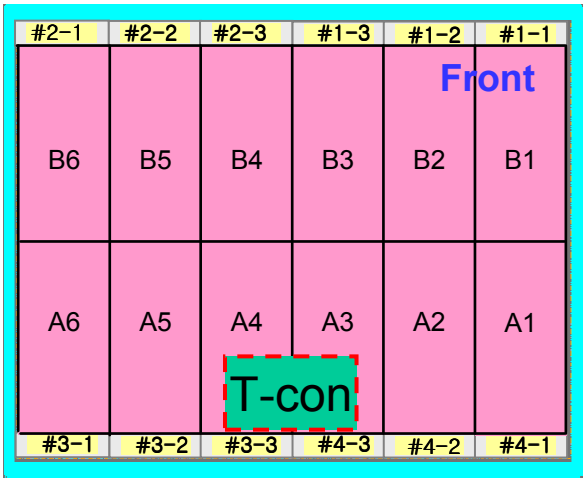
APPENDIX- IV

■ Local Dimming Block Pin Matching

[CN2]

Pin No	Block
1	Vo_2
2	N.C
3	**A6**
4	**A5**
5	**A4**
6	N.C
7	N.C
8	N.C
9	**A3**
10	**A2**
11	**A1**
12	N.C
13	Vo_2





[CN1]

Pin No	Block
1	Vo_1
2	N.C
3	**B1**
4	**B2**
5	**B3**
6	N.C
7	N.C
8	**B4**
9	**B5**
10	**B6**
11	N.C
12	Vo_1

APPENDIX- V

■ LC420EUS-SCM1-Source D-IC Power Sequence